



RESEARCH ARTICLE

## Investigation of the Effects of Physical Activity Level on Posture, Depression and Sleep Quality in University Students

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### Abstract

University years are a critical period for physical activity, which has physical, mental, and social benefits throughout life. This study aimed to understand how the posture, depression, and sleep quality levels of university students with different physical activity levels are affected and to emphasize the importance of interventions that increase physical activity levels. Our study included 366 students from Ankara Medipol University who were studying in 2022-2023 and agreed to participate in our study. Postures of students; with Posture Screen Mobile, physical activity levels; with the International Physical Activity Questionnaire (IPAQ), depression levels; with the Beck Depression Inventory (BDI), and Sleep quality; with the Sleep Quality Scale and Sleep Variables Questionnaire (SQS-SVS) were evaluated. According to the results obtained from the study, when the Beck Depression Inventory scores of the students were compared according to their physical activity levels, there was a difference in favor of the physically active group ( $p < 0.05$ ), while no difference was found in the sleep quality scale scores ( $p > 0.05$ ). No difference was observed between the groups when the posture disorders were compared according to the student's physical activity levels ( $p > 0.05$ ). When university students were classified according to different physical activity levels, it was determined that sleep quality and posture disorders did not change, while depression levels were positively affected as activity levels increased. Directing students to physical activities and evaluating their posture and directing them to necessary activities is essential.

### Keywords

University Students, Posture, Physical Activity, Depression

## INTRODUCTION

It is known that physical activity, which is defined as any bodily movement that occurs with the contraction of skeletal muscles and requires energy expenditure above the basal level, increases the satisfaction level of individuals in every period of life and increases the ability to fight against the

problems that may be encountered (Piggin, 2020). University years are when individuals try to complete their development and maturation quickly and try to learn the professions they will continue throughout their lives. During this period, individuals may reduce their social and physical activities, primarily due to academic success concerns (Kohl and Cook, 2013).

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However, studies report that social and physical activities to be done during the university period will positively contribute to the academic success of the individual and his post-university life (Lipošek et al. 2018). The most important benefit of physical activities during university is permanent habits. Studies show that individuals who start physical activities during their university years or continue to do so in this period try to continue activities throughout their lives. This will allow individuals to continue the benefits of physical activity throughout their lives (Carballo-Fazanes et al. 2020).

One of the essential contributions of physical activity to individuals during the university period is the support it provides to the physical development of individuals (Pan et al. 2022). Deterioration in posture may not only affect the physiological processes of individuals but also lead to mental and social negativities (Nair et al. 2015). As it is known, physical activity supports the mental and spiritual development of the individual as well as the physical development of the individual and ensures that the sense of satisfaction he can get from life is maximized (Gill et al. 2013). In addition, physical activity supports individuals to have better sleep quality. Quality sleep can depend on many factors. However, providing adequate daily physical activity is essential in quality sleep strategies. Good sleep is vital for individuals to have fewer depressive symptoms and maintain life satisfaction by providing the energy required for the next day. In addition, studies show that sleep quality is affected by postural changes (Wunsch et al. 2017).

A lifestyle with low levels of physical activity will negatively affect individuals in every sense. Staying away from activities, especially during the university years, which we call young adults, can negatively affect posture and cause many problems in students, primarily pain and external appearance. It may cause an increase in students' social isolation and depressive symptoms and reduce their quality of life (Tigli et al. 2020). Therefore, directing students to activities during their university years is a mission of universities. In this context, many universities today give importance to social and sportive performance as much as academic performance. With various organizations and school clubs, students are tried to be directed to physical and social activities (Foubert and Urbanski, 2006).

Studies in the literature show that students' mood and sleep quality are negatively affected by

both the pandemic and the technological processes, and physical activity decreases. (Merellano-Navarro et al. 2022; Pelucio et al. 2022; López-Valenciano et al. 2021). All these processes will naturally affect the postures of the students negatively. Today, the relationship between health and physical activity is getting stronger. Although the relationship between studies and physical activity, depression, and quality of life has been discussed, the limitations of these studies are the small sample size and methodological inadequacy (Pearce et al. 2022; de Oliveira et al. 2019; Slimani et al. 2020). In addition, only one study examines the correlation between physical activity and posture, which is important for healthy development, especially for young adults during their university years (Fernani et al. 2017). Only one hundred people were included in this study, which only gave information about the concavity of the lumbar region with the evaluation method used in posture analysis.

Based on all these studies, different physical activity levels may affect university students' postures, mental states, and sleep quality. This study aims to examine how posture, depression, and sleep quality affect university students with different physical activity levels and emphasize the importance of interventions that increase physical activity levels.

## MATERIALS AND METHODS

### *Study design and population*

Our study, planned as a cross-sectional research, included 366 volunteer students between the ages of 18-30, with a BMI between 18-30 and not using any medication, who was educated at Ankara Medipol University in 2022-2023, who agreed to participate in the study. Individuals with neurological or chronic systemic diseases, sleep apnea, or diagnosed psychiatric disorders, individuals with a history of trauma in the last six months, and individuals who had undergone musculoskeletal surgery were not included in the study. Before starting the study, Ankara Medipol University Non-Interventional Clinical Research Ethics Committee approval was obtained (Date: 18/10/2022 Decision No: 0174). Before the study, all individuals were informed about the study, and an 'Informed Consent Form' was signed. Participants in the study were evaluated by mobile

application and filled out data collection questionnaires. Our study was conducted in accordance with the Principles of the Declaration of Helsinki.

### *Measuring methods*

The individuals included in the study were evaluated in face-to-face interviews. The data was recorded by mobile application and questionnaire forms. Demographic (name-surname, age, height) information of the individuals was obtained. In addition, their posture, physical activity levels, depression levels and sleep quality were evaluated. Measurements were made during the non-exam period.

In our study, posture was evaluated with "Posture Screen Mobile (PSM)" (posture analysis/body composition/motion assessment software). PSM is an application developed and proven to evaluate posture with the help of a camera system on mobile devices (Hopkins, 2014). Photographs of the participants are taken from the front, back, right, and left, wearing appropriate clothes, with their upper body and knees open, without predetermining reference points on the person. The photographs taken are evaluated by determining the anatomical reference points on the photograph with PSM. According to these marked points, it is calculated as the degree of deviation from the normal posture for each individual through the software. The degrees of each individual's anterior (frontal plane), posterior (frontal plane), and right and left lateral (sagittal plane) posture disorders are reported by the PSM.

The International Physical Activity Questionnaire (IPAQ) was used in our study (Lee et al. 2011). The Turkish version of the questionnaire consisting of seven questions covering the time spent in activities in the last seven days, was used in our study (Sağlam et al. 2010). The questionnaire defines individuals as physically inactive (<600 MET-min/week), low physical activity levels (600 – 3000 MET-min/week), and sufficient physical activity levels (>3000 MET-min/week).

The Beck Depression Scale (BDI) was used to measure the mental health levels of individuals (Beck et al. 1961). In BDI, a 21-item self-evaluation type scale, items are evaluated on a scale ranging from zero to three depending on the severity of their symptoms. The score range is 0-63. The Turkish version of the BDI questionnaire was used in our study (Hisli et al. 1989). The Cronbach's alpha

value of this study, which was 0.858, was 0.74 in Hisli's validity and reliability study.

The Sleep Quality Scale and Sleep Variables Questionnaire (Meijer and van den Wittenboer 2004), used to evaluate the sleep quality of individuals, includes seven scale items measuring sleep quality and eight items describing parental control, total sleep duration, midpoint, and effectiveness. In our study, only the sleep quality part of the scale was used. The scores that can be obtained from the sleep quality scale range from 7 to 21, while high scores indicate poor sleep and low scores indicate good sleep. The Turkish version of the Questionnaire was used in our study (Önder et al. 2016). The Turkish version of the Questionnaire was used in our study (Önder et al. 2016). The scale's Cronbach Alpha internal consistency coefficient for seven items measuring sleep quality was determined as 0.77, and that of this study was 0.791.

### *Statistical analyses*

Statistical analyzes of the study were performed using the "Statistical Package for Social Sciences" (SPSS) version 21.0 (SPSS inc. Chicago, IL, USA). Visual (histogram, probability graphs) and analytical methods (Kolomogrov-Smirnov/Shapiro-Wilk's test) were used to define whether the variables were normally distributed. Customarily distributed numerical variables will be shown as mean±standard deviation, and non-normally distributed variables will be shown as the median. The Kruskal-Wallis Test was used for more than two groups for intergroup comparisons of numerical data that did not fit the normal distribution. In cases where there was a difference due to this test, the groups were compared in pairs using the Mann-Whitney U test to determine the difference. One-way ANOVA and post hoc analyzes were used to compare more than two groups in cases with normal distribution. Chi-square analysis was performed for categorical data in the evaluation between groups. Spearman correlation analysis was used to determine the relationship between continuous variables.

**RESULTS**

In our study, which included 366 volunteer university students, 95 participants were inactive, 173 had low, and 98 had sufficient physical activity levels. Age, BMI, gender, and smoking status of individuals according to their physical activity levels are given in Table 1. While no

difference was observed in terms of age, BMI, and gender according to the physical activity level groups ( $p>0.05$ , Table 1), there was a significant difference in smoking in the physically inactive group ( $p<0.05$ , Table 1).

**Table 1.** Demographic characteristics of students by physical activity levels

		Physical Activity Level			P
		Physically Inactive Median (IQR) (n=95)	Low Physical Activity Level Median (IQR) (n=173)	Physical Activity Level Sufficient Median (IQR) (n=98)	
Age (years)		20 (18-24)	20 (18-29)	20 (18-25)	0.459 <sup>a</sup>
BMI (kg/m <sup>2</sup> )		20,44 (18.22-29.87)	22,01 (18.53-26.86)	22,15 (18.07-29.80)	0.110 <sup>a</sup>
Gender n(%)	Female	78 (82.1)	139 (80.3)	84 (85.7)	0.384 <sup>b</sup>
	Male	17 (17.9)	34 (19.7)	14 (14.3)	
Smoking n(%)	Yes	41 (43.2)	46 (26.6)	20 (20.4)	<b>0.001<sup>b</sup></b>
	No	54 (56.8)	127 (73.4)	78 (79.6)	

\*p < 0.05, m: meter, kg: kilogram, BKI: body mass index, a: Kruskal Wallis Test, b: Chi-Square Test.

When the results of the assessment methods used in the study were correlated with each other, a significant negative correlation was observed between IPAQ and Beck Depression Inventory and between Beck Depression Inventory and Sleep Quality Scale Scores ( $p<0.05$  Table 2). A

significant positive correlation was observed between the degree of posterior postural disorder and the degree of anterior postural disorder and between the degree of right posture disorder and left postural disorder ( $p<0.05$ , Table 2).

**Table 2.** Correlation between the scale scores

	IPAQ		SQSS		BDI		DOAPD (°)		DOPPD (°)		DORPD (°)		DOLPD (°)	
	r	p	r	p	r	p	r	p	r	p	r	p	R	p
IPAQ	-	-	0.037	0.486	-0.14	<b>0.005*</b>	0.070	0.180	-0.01	0.755	-0.01	0.979	-0.12	0.813
SQSS	0,03	0.486	-	-	-0.35	<b>0.001*</b>	0.031	0.553	0.06	0.185	0.04	0.378	0.03	0.525
BDI	-0.14	<b>0,005*</b>	-0.36	<b>0.001*</b>	-	-	-0.02	0.617	0.07	0.172	-0.01	0.871	-0.01	0.843
DOAPD (°)	0.07	0.180	0.03	0.553	-0.02	0.617	-	-	0.33	<b>0.001*</b>	0.03	0.511	0.03	0.553
DOPPD (°)	-0.01	0.755	0.06	0.185	0.07	0.172	0.33	<b>0.001*</b>	-	-	0.01	0.807	0.03	0.565
DORPD (°)	-0.00	0.979	0.04	0.378	-0.01	0.871	0.03	0.511	0.01	0.807	-	-	0.50	<b>0.001*</b>
DOLPD (°)	-0.12	0.813	0.03	0.525	-0.01	0.843	0.03	0.553	0.03	0.565	0.50	<b>0.001*</b>	-	-

Spearman correlation analysis, \*p < 0.05, r: correlation coefficient, IPAQ: International Physical Activity Questionnaire, SQSS: Sleep Quality Scale Scores, BDI: Beck Depression Inventory, DOAPD: Degree of anterior posture disorder, DOPPD: Degree of posterior posture disorder, DORPD: Degree of right posture disorder, DOLPD: Degree of left posture disorder

When the beck depression inventory scores of the students were compared according to their physical activity levels, a difference was found in favor of the physically active group ( $p < 0.05$ , Table 3). No difference was found when the Sleep Quality Scale Scores were compared according to

the student's physical activity levels ( $p > 0.05$ , Table 3). When the posture disorders of the students were compared according to their physical activity levels, no significant difference was observed between the groups to any degree ( $p > 0.05$ , Table 4).

**Table 3.** Comparison of depression and sleep quality according to students' physical activity level

	Physical Activity Level			p
	Physically Inactive Median (IQR) (n=95)	Low Physical Activity Level Median (IQR) (n=173)	Physical Activity Level Sufficient Median (IQR) (n=98)	
Beck Depression Inventory	14 (0-52)	13 (0-48)	11 (0-49)	<b>0.034*</b>
Sleep Quality Scale Scores	15 (8-20)	15 (8-21)	15 (7-21)	0.940

Kruskal Wallis Test, \* $p < 0.05$

**Table 4.** Comparison of postures according to students' physical activity levels

	Physical Activity Level			p	f
	Physically Inactive X ± SD (n=95)	Low Physical Activity Level X ± SD (n=173)	Physical Activity Level Sufficient X ± SD (n=98)		
Degree of anterior posture disorder (°)	6.00±3.47	6.24±3.27	6.31±3.98	0.807	0.214
Degree of posterior posture disorder (°)	23.92±10.29	23.21±10.70	23.03±9.71	0.811	0.210
Degree of right posture disorder (°)	28.87±10.09	28.06±9.12	27.93±8.05	0.730	0.315
Degree of left posture disorder (°)	25.55±9.58	24.17±9.43	25.17±8.83	0.460	0.779

One way anova test, X ± SD: Mean ± Standart Deviation

## DISCUSSION

In conclusion, this study aimed to examine how the posture, depression, and sleep quality levels of university students with different physical activity levels are affected and to underline the importance of interventions that increase physical activity levels. When the university students participating in our study were categorized according to their physical activities, it was observed that the individuals with sufficient physical activity levels smoked the least.

Similar to our study, studies in the literature have shown that an increase in the activity level of university students helps to stay away from

harmful habits. (Romaguera et al. 2011; Alaraja et al. 2018; Kuloglu, 2023). It has been said that one of the essential keys to a healthy life is physical activity. It has been stated that individuals try to reduce their harmful habits, such as smoking, to increase the benefits of physical activity. Similar to the literature, our study found the least smoking in students with higher physical activity levels. We think this result is due to the student's desire to increase the benefits of physical activity, which is one of the critical investments they make in themselves.

Our study observed a negative correlation between the BDI and the total scores of IPAQ and SQSS.

Similar to the result of our study, many studies have shown that depression levels are associated with physical activity (Xiang et al. 2020; Luo et al. 2022; Coughenour et al. 2021). Also, there is a relationship between depression level and the sleep quality of individuals (Iyigun et al. 2017; Ozkan et al. 2015). It increases self-confidence in individuals thanks to both the physical and mental benefits that physical activity provides. It provides the power to cope with negative thoughts, especially with the self-confidence it provides; in this case, it helps individuals to increase their mood levels. Thus, a decrease in depressive levels is achieved (Zamani Sani et al. 2016; Legey et al. 2017). Likewise, individuals experience vicious cycles related to depression and sleep—the decreased sleep duration and quality cause the individual to start the next day in a lower mood. A person in a depressive state cannot have a good sleep pattern (Oginska and Pokorski, 2006). On the contrary, if individuals have good sleep quality, they can struggle more easily with the problems they encounter during the day. If the individual has fewer depressive symptoms, he/she can sleep more comfortably and efficiently at night (Raniti et al. 2017).

Our study observed a relationship between anterior postural disorder and posterior postural disorder and between right posture disorder and left posture disorder. It is known that the anterior, posterior, right, and left postures are interrelated, and the posture consists of complementary structures (Carini et al. 2017; Ferreira et al. 2011). Anterior-posterior and right-left postures are on the same axis in themselves. Therefore, if a disorder is observed in the anterior, it will also have a consequence in the posterior. Similarly, if a disorder is observed on the right side, it will also result on the left side. As seen at the end of our study, good posture will include the harmony of all parts of the body with each other.

When the students in our study were classified according to their physical activity levels, a statistically significant difference was observed between the BDI results. Similarly, studies have reported that a decrease in physical activity levels in students negatively affects depression levels. On the contrary, increased physical activity positively affects depression (Bulguroglu et al. 2021; Talapko et al. 2021). Physical activity plays a crucial role in individuals'

struggles with depression. The developments that occur in the body of individuals with physical activity provide physical and mental development in individuals. Both mental and physical development will positively affect the individual's life. They will facilitate the removal of depressive symptoms (Legey et al. 2017). The statistical significance of our study was obtained from the fact that the depression level of the group with sufficient physical activity level was lower. Although the depression levels of our students in our study were not high, we think that the most crucial reason why it was lower in the group with sufficient physical activity level was the physical development provided by physical activity. College years are the young adult years of students. In these years, individuals especially attach importance to their external appearance. This encourages students to participate in physical activity (Egli et al. 2011). Thus, through orientation to physical activity, students gain other benefits and the physical benefits of physical activity. One of these benefits is their academic achievement. Studies have shown that physically active students are also academically successful (Fox et al. 2010). In addition, with the self-confidence it provides, students can make more explicit decisions and avoid negative emotions (Xiang, et al. 2020). We think that all these reduce the level of depression in university students with sufficient physical activity levels.

When the students in our study were classified according to their physical activity levels, no statistically significant difference was found between the Sleep Quality Scale Scores.

In the literature, different results are observed with our study. Studies show that, especially with the decrease in physical activity levels of university students, their sleep quality deteriorates (Memon et al. 2021; Ghrouz et al. 2019). We think the most critical difference between our results and those observed in other studies stems from the questionnaire we used. Although the Sleep Quality Scale Scores, which we used in our study, were used to measure sleep quality, the more detailed questions of the Pittsburgh sleep quality scale and the more detailed scoring of the results may make it more useful, especially in the population without serious sleep problems. In addition, studies show that the sleep quality problems observed in university students are primarily due to physical problems such as

staying in dormitories, bed problems, or living in crowded environments (Orzech et al. 2011). The fact that we did not question the physical environment in which the students live may have paved the way for this result. All these situations may have caused us to find differences in our study's sleep quality levels in students with different physical activity levels.

When the students in our study were classified according to their physical activity levels, no statistically significant difference was found between all posture disorder results.

Although postural disorders of students are not classified according to different physical activity levels in the literature, it has been shown that many postural disorders may occur with a decrease in physical activity levels (Wyszyńska et al. 2016; Kiers et al. 2013). We think that their disorders are not affected because they did not perform physical activity in the presence of a specialist. Posture disorders are problems that can occur in any plane, especially in young adulthood, which are essential for individuals throughout their lives (Grimes, P., & Legg, S ). Specialists should evaluate posture disorders, and individuals should be given physical activities specific to their disorders. Physical activities, in general, will not be effective in postural disorders and may cause disorders of individuals to be adversely affected. For these reasons, students with posture disorders should be referred to a specialist. The increase in the physical activities of university students will make them feel stronger and more confident. It will positively affect many parameters of their education and later life, especially their depressive symptoms.

Although we did not find a statistical difference in students with different physical activity levels in our study, we know from studies in the literature that physical activity is effective in the management of sleep problems and better postural development (Wyszyńska et al. 2016; Kiers et al. 2013; Memon et al. 2021; Ghrouz et al. 2019). We health professionals should emphasize the importance of the physical activity to all individuals in society, especially university students, and direct them to physical activity to increase their self-confidence and purify them from depressive thoughts. In addition, as in all their lives, the students' postures should be evaluated in detail in these periods, and each student should be directed to physical activity for

their disorders. A limitation of our study is that we did not question the menstrual cycle, which may affect women's mood levels at the time of measurement.

#### Conclusion

Health professionals should draw attention to the importance of physical activity in every part of society at every opportunity and direct them to physical activity. The importance of doing physical activity and staying active in order to gain healthy habits, especially at university age, was once again emphasized in this study.

As a result, our study will guide the literature that it is essential to direct university students to various physical activities. That posture disorders that may occur in students during orientation to these activities should be evaluated and directed to activities suitable for their disorders. Furthermore, future studies could investigate the long-term effects of physical activity on university students' mental and physical health, as well as the relationship between physical activity, sleep quality, and postural disorders.

In conclusion, this study highlights the need for interventions to increase physical activity levels among university students and emphasizes the importance of physical activity in maintaining mental health and well-being.

#### Declaration of Conflicting Interests

All authors declare no conflicts of interest.

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#### Ethics Statement

The study protocol was approved by Ankara Medipol University Non-Interventional Clinical Research Ethics Committee (18/10/2022 Decision No: 0174) and written informed consent was obtained from the participants before starting the study.

#### Author Contributions

Study Design, HIB, MB; Data Collection, CGA, SZ, SD, KK; Statistical Analysis, CSG; Data Interpretation, HIB; Manuscript Preparation, HIB; Literature Search, MB. All authors have read and agreed to the published version of the manuscript.

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